What is claimed is:

1. A method for retrieving an image texture descriptor for describing texture features of an image, comprising the steps of:

(a) filtering input images using predetermined filters having different orientation coefficients;

(b) projecting the filtered images onto axes of each predetermined direction to obtain data groups consisting of averages of each directional pixel values;

(c) selecting candidate data groups among the data groups by a predetermined classification method;

(d) determining a plurality of indicators based on orientation coefficients of the filters used in filtering the candidate data groups; and

(e) determining the plurality of indicators as the texture descriptor of the image.

2. The image texture descriptor retrieving method according to claim 1, wherein the step (a) further comprises the step of (a-1) filtering input images using predetermined filters having different scale coefficients, and the step (d) further comprises the step of (d-1) determining a plurality of indicators based on scale coefficients of the filters used in filtering the candidate data groups.

3. The image texture descriptor retrieving method according to claim 2, further comprising the step of determining another indicator based on the presence of data groups filtered by filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected candidate data groups.

4. The image texture descriptor retrieving method according to claim 3, further comprising the step of calculating the mean and variance of pixels with respect to each of the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

5. The image texture descriptor retrieving method according to claim 2, further comprising the step of calculating the mean and variance of pixels with

respect to the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

6. The image texture descriptor retrieving method according to claim 1, further comprising the step of determining another indicator based on the presence of graphs filtered by filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected candidate data groups.

7. The image texture descriptor retrieving method according to claim 6, further comprising the step of calculating the mean and variance of pixels with respect to each of the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

8. The image texture descriptor retrieving method according to claim 1, further comprising the step of calculating the mean and variance of pixels with respect to each of the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

9. A method for retrieving an image texture descriptor for describing texture features of an image, comprising the steps of:

(a) filtering input images using predetermined filters having different scale coefficients;

(b) projecting the filtered images onto axes of each predetermined direction to obtain data groups consisting of averages of each directional pixel values;

(c) determining a plurality of indicators based on scale coefficients of the filters used in filtering data groups selected among the data groups by a predetermined selection method;

(d) determining the plurality of indicators as the texture descriptor of the image.

10. The image texture descriptor retrieving method according to claim 9, further comprising the step of calculating the mean and variance of pixels with

respect to the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

11. A method for retrieving an image texture descriptor for describing texture features of an image, comprising the steps of:

(a) filtering input images using predetermined filters having different orientation coefficients and different scale coefficients;

(b) projecting the filtered images onto axes of each predetermined direction to obtain graphs consisting of averages of each directional pixel values;

(c) selecting candidate graphs among the graphs obtained in the step (b) by a predetermined classification method;

(d) determining another indicator based on the presence of graphs filtered by filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected candidate graphs;

(e) determining a plurality of indicators based on scale coefficients or orientation coefficients of the filters used in filtering the determined candidate graphs; and

(f) determining the indicator determined in the step (d) and the plurality of indicators determined in the step (e) as the texture descriptor of the image.

12. The image texture descriptor retrieving method according to claim 11, further comprising the step of calculating the mean and variance of pixels with respect to the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

13. A method for retrieving an image texture descriptor for describing texture features of an image, comprising the steps of:

(a) filtering input images using predetermined filters having different orientation coefficients and different scale coefficients;

(b) projecting the filtered images onto horizontal and vertical axes to obtain horizontal-axis projection graphs and vertical-axis projection graphs;

(c) calculating normalized auto-correlation values for each graph;

(d) obtaining local maximums and local minimum for each normalized auto-correlation value, at which the calculated normalized auto-correlation values forms a local peak and a local valley at a predetermined section;

(e) defining the average of the local maximums and the average the local minimums as contrast;

(f) selecting graphs in which the ratio of the standard deviation to the average of the local maximums is less than or equal to a predetermined threshold as first candidate graphs;

(g) determining the type of the second candidate graphs according to the number of graphs filtered by the filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected second candidate graphs;

(h) counting the numbers of graphs belonging to the respective types of second candidate graphs and determining predetermined weights of each type of second candidate graphs;

(i) calculating the sum of products of the counted numbers of graphs and the determined weights to determine the calculation result value as a first indicator constituting a texture descriptor;

(j) determining the orientation coefficients and scale coefficients of the second candidate graphs having the biggest contrast as second through fifth indicators; and

(k) determining indicators including the first indicator and the second through fifth indicators as the texture descriptors of the corresponding image.

14. The image texture descriptor retrieving method according to claim 13, further comprising the step of calculating the mean and variance of pixels with respect to the filtered images, and obtaining a predetermined vector using the calculated mean and variance, wherein the step (k) includes the step of determining indicators including the first indicator, the second through fifth indicators and the predetermined vector as the texture descriptors of the corresponding image.

15. The image texture descriptor retrieving method according to claim 1, wherein the normalized auto-correlation, denoted by *NAC(k)*, is calculated by the following formula:

$$NAC(k) = \frac{\sum_{m=k}^{N-1} P(m-k)P(m)}{\sqrt{\sum_{m=k}^{N-1} P^2(m-k)\sum_{m=k}^{N-1} P^2(m)}}$$

wherein *N* is a predetermined positive integer, an input image consists of N×N pixels, a pixel position is represented by i, where i is a number from 1 to *N*, the projection graphs expressed by pixels of the pixel position i is represented by *P(i)* and *k* is a number from 1 to *N*.

16. The image texture descriptor retrieving method according to claim 13, wherein the contrast is determined as:

$$contrast = \frac{1}{M}\sum_{i=1}^{M} P\_magn(i) - \frac{1}{L}\sum_{i=1}^{L} V\_magn(i)$$

wherein *P_magn (i)* and *V_magn (i)* are the local maximums and local minimums determined in the step (d).

17. The image texture descriptor retrieving method according to claim 13, wherein in the step (f), the graphs satisfying the following formula are selected as first candidate graphs:

$$\frac{S}{d} \le \alpha$$

wherein *d* and *S* are the average and standard deviation of the local maximums and α is a predetermined threshold.

18. The image texture descriptor retrieving method according to claim 13, wherein the step (g) comprises the sub-steps of:

(g-1) if there are one or more graphs having scale or orientation coefficients identical with those of a pertinent candidate graph and one or more graphs having scale or orientation coefficients close to those of the pertinent candidate graph, classifying the pertinent candidate graph as a first type graph;

(g-2) if there are one or more graphs having scale or orientation coefficients identical with those of a pertinent candidate graph but there is no graph having scale or orientation coefficients close to those of the pertinent candidate graph, classifying the pertinent candidate graph as a second type graph; and

(g-3) if there is no graph having scale or orientation coefficients identical with or close to those of a pertinent candidate graph, classifying the pertinent candidate graph as a third type graph.

19. The image texture descriptor retrieving method according to claim 13, wherein the step (h) includes the step of counting the number of graphs belonging to each of the first through third types of graphs and determining predetermined weights for each of the types of graphs.

20. The image texture descriptor retrieving method according to claim 13, after the step of (f), further comprising the step of applying a predetermined clustering algorithm to the first candidate graphs to select second candidate graphs.

21. The image texture descriptor retrieving method according to claim 20, wherein the predetermined clustering algorithm is modified agglomerative clustering

22. The image texture descriptor retrieving method according to claim 13, wherein in the step (j), the orientation coefficient of a graph having the biggest contrast, among the horizontal-axis projection graphs, is determined as a second indicator; the orientation coefficient of a graph having the biggest contrast, among the vertical-axis projection graphs, is determined as a second indicator; the scale coefficient of a graph having the biggest contrast, among the horizontal-axis projection graphs, is determined as a fourth indicator; and the scale coefficient of a graph having the biggest contrast, among the vertical-axis projection graphs, is determined as a fifth indicator.

23. The image texture descriptor retrieving method according to claim 13, wherein the step (j) includes the step of determining indicators including the first indicator, the second through fifth indicators and the predetermined vector as the texture descriptors of the corresponding image.

24. The image texture descriptor retrieving method according to claim 13, wherein the predetermined filters include Gabor filters.

25. The image texture descriptor retrieving method according to claim 14, wherein the predetermined filters include Gabor filters.

26. The image texture descriptor retrieving method according to claim 15, wherein the predetermined filters include Gabor filters.

27. The image texture descriptor retrieving method according to claim 16, wherein the predetermined filters include Gabor filters.

28. The image texture descriptor retrieving method according to claim 17, wherein the predetermined filters include Gabor filters.

29. The image texture descriptor retrieving method according to claim 18, wherein the predetermined filters include Gabor filters.

30. The image texture descriptor retrieving method according to claim 19, wherein the predetermined filters include Gabor filters.

31. A computer readable medium having program codes executable by a computer to perform a method for an image texture descriptor for describing texture features of an image, the method comprising the steps of:

(a) filtering input images using predetermined filters having different orientation coefficients and different scale coefficients;

(b) projecting the filtered images onto horizontal and vertical axes to obtain horizontal-axis projection graphs and vertical-axis projection graphs;

(c) calculating normalized auto-correlation values for each graph;

(d) obtaining local maximums and local minimums for each of normalized auto-correlation values, at which the calculated normalized auto-correlation value forms a local peak and a local valley at a predetermined section;

(e) defining the average of the local maximums and the average the local minimums as contrast;

(f) selecting graphs in which the ratio of the standard deviation to the average of the local maximums is less than or equal to a predetermined threshold as first candidate graphs;

(g) determining the type of the second candidate graphs according to the number of graphs filtered by the filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected second candidate graphs;

(h) counting the numbers of graphs belonging to the respective types of second candidate graphs and determining predetermined weights of each type of second candidate graph;

(i) calculating the sum of products of the counted numbers of graphs and the determined weights to determine the calculation result value as a first indicator constituting a texture descriptor;

(j) determining the orientation coefficients and scale coefficients of the second candidate graphs having the biggest contrast as second through fifth indicators; and

(k) determining indicators including the first indicator and the second through fifth indicators as the texture descriptors of the corresponding image.

32. The computer readable medium according to claim 31, wherein the image texture descriptor retrieving method further comprises the step of calculating the mean and variance of pixels with respect to the filtered images, and obtaining a predetermined vector using the calculated mean and variance, and wherein the step (k) includes the step of determining indicators including the first indicator, the

second through fifth indicators and the predetermined vector as the texture descriptors of the corresponding image.

33. An apparatus method for retrieving an image texture descriptor for describing texture features of an image, comprising:

filtering mean for filtering input images using predetermined filters having different orientation coefficients;

projecting means for projecting the filtered images onto axes of each predetermined direction to obtain data groups consisting of averages of each directional pixel values;

classifying means for selecting candidate data groups among the data groups by a predetermined classification method;

first indicator determining means for determining another indicator based on the number of graphs filtered by filters having scale coefficients or orientation coefficients which are close to or identical with the scale coefficients or orientation coefficients of the filters used in filtering the selected candidate graph; and

second indicator determining means for determining a plurality of indicators based on scale coefficients and orientation coefficients of the filters used in filtering the determined candidate graphs.

34. The image texture descriptor retrieving apparatus according to claim 33, further comprising mean/variance calculating means for calculating the mean and variance of pixels with respect to each of the filtered images, and obtaining a predetermined vector using the calculated mean and variance.

35. An apparatus for retrieving an image texture descriptor for describing texture features of an image, comprising:

a filtering unit for filtering input images using predetermined filters having different orientation coefficients and different scale coefficients;

an image mean/variance calculating unit for calculating the mean and variance of pixels with respect to each of the filtered images, and obtaining a predetermined vector using the calculated mean and variance;

a projecting unit for projecting the filtered images onto horizontal and vertical axes to obtain horizontal-axis projection graphs and vertical-axis projection graphs;

a calculating unit for calculating a normalized auto-correlation value for each graph;

a peak detecting/analyzing unit for detecting local maximums and local minimums for each auto-correlation value, at which the calculated normalized auto-correlation values forms a local peak and a local valley at a predetermined section;

a mean/variance calculating unit for calculating the average of the local maximums and the average the local minimums;

a first candidate graph selecting/storing unit for selecting the graphs satisfying the requirement that the ratio of the standard deviation to the average of the local maximums be less than or equal to a predetermined threshold, as first candidate graphs;

a second candidate graph selecting/storing unit for applying a predetermined clustering algorithm to the first candidate graphs to select the same as second candidate graphs;

a classifying unit for counting the number of graphs belonging to each of the respective types of the second candidate graphs, outputting data signals indicative of the number of graphs of each type, determining predetermined weights of the graphs belonging to the respective types and outputting data signals indicative of weights to be applied to each type;

a first indicator determining unit for calculating the sum of the products of the data representing the number of graphs belonging to each type, and the data representing the weights to be applied to each type, determining and outputting the calculation result as a first indicator constituting a texture descriptor;

a contrast calculating unit for calculating the contrast according to formula (2) using the averages output from the mean/variance calculating unit and outputting a signal indicating that the calculated contrast is biggest;

a second candidate graph selecting/storing unit for outputting the candidate graphs having the biggest contrast among the second candidate graphs stored therein in response to the signal indicating that the calculated contrast is biggest;

a second-to-fifth indicator determining unit for determining the orientation coefficient of a graph having the biggest contrast, among the horizontal-axis

projection graphs; the orientation coefficient of a graph having the biggest contrast, among the vertical-axis projection graphs, as a second indicator; the scale coefficient of a graph having the biggest contrast, among the horizontal-axis projection graphs, as a fourth indicator; and the scale coefficient of a graph having the biggest contrast, among the vertical-axis projection graphs, as a fifth indicator; and

a texture descriptor output unit for combining the first indicator, the second through fifth indicators and the predetermined vector and outputting the combination result as the texture descriptors of the corresponding image.